



Appendix A

Flexible Polyurethane Foams

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Since nucleating aids are not universally successful, some authors, notably Baumhake, argue that the gases involved in nucleation come solely from gas loading of the initial reaction components.^{3.7} Such loading will include gas from:

- Dissolved gas loading of the polyol and isocyanate during storage,
- Entrainment of bubbles during the liquids handling and mixing process (work provided by mechanical energy input).

Dissolved gases are defined as those gas molecules present as a 'solute' phase in a polyol, isocyanate or other liquid formulation ingredients. The maximum amount of a given gas that a liquid will absorb at standard conditions (1 atmosphere and 25°C) is termed the Bunsen Coefficient.^{3.8} Most polyether polyols exhibit a Bunsen Coefficient in the range of 6-10 volume percent.^{3.9}

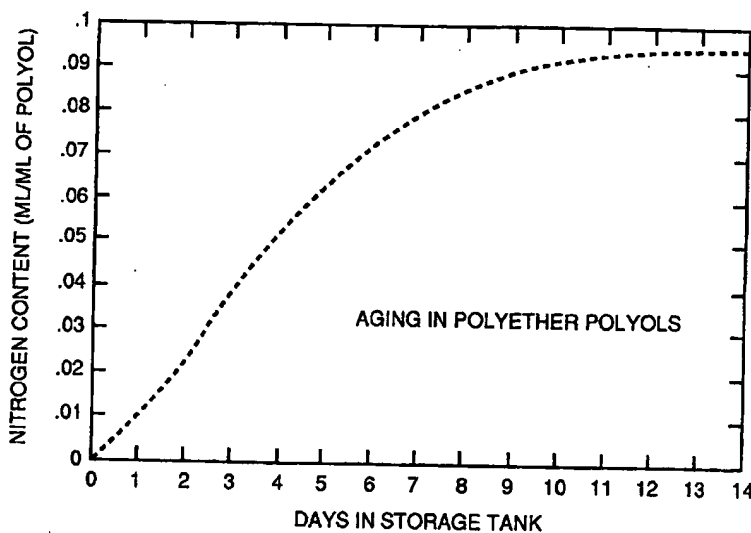


Figure 3.6 Gas Content of Polyol Varies with Storage History

Figure 3.6 illustrates that the actual degree of loading of dissolved gas such as nitrogen into a polyol (or isocyanate) is a significant variable related to storage history. Without allowing sufficient time for freshly produced raw materials to absorb a loading of nitrogen, foam cell-size and stability problems are known to result.^{3.10} The amount of dissolved gas in an isocyanate is reported to vary widely and to be a function of pad gas pressure.^{3.11-3.12} Excessive amounts of dissolved gas in the isocyanate are reported to lead to foam collapse.^{3.13-3.14}

Problems have also been encountered when excessive amounts of entrained gas are allowed to form in viscous component streams. Entrained gas can be helpful in proper nucleation of a foam mixture. The amount of entrained gas that can be tolerated depends on the formulation, the metering system, the mixer geometry and the desired final foam cell-structure. If the amount of gas becomes excessive; metering problems can result, pea holes can form, density can vary and in severe cases, total collapse of the foam may occur.^{3.15-3.16}